Nutrition and MS: An update

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Veterans Affairs MS Centers of Excellence www.va.gov/ms

OREGON HEALTH & SCIENCE UNIVERSITY OHSU

MS and Disability (Natural history)

- **Fifteen years after diagnosis**
  - ~ 80% of patients with MS have some functional limitation
  - ~50% to 60% require assistance when ambulating
  - ~ 70% - limited or unable to perform major activities of daily living
  - ~ 75% - not employed

Common Comorbidities in MS can affect disease course or activity

- **Emerging data suggests non-MS related health problems may make MS worse**
  - Vascular disease risk factors appear to accelerate disease
  - Obese children more likely to get MS
  - Smoking
  - Vitamin D Deficiency
- **Modern life style may be increasing the risk of developing MS**

Comorbidities and effect on hospitalization in MS

- **Two-fold higher all-cause hospitalization rate in MS patients with one or more comorbidities than without any comorbidity**

Marrie RA, Elliott L, Marriott J, et al. Comorbidity increases the risk of hospitalizations in multiple sclerosis. Neurology 2015; 84: 350–358.

Comorbidities and effect on mortality in MS

- **Study: 5,797 MS vs. 28,807 matched controls**
- **Compared causes of death between populations**
- **Median survival from birth:**
  - MS - 75.9 yrs vs 83.4 yrs matched population
- **MS was associated with a 2-fold increased risk of death**
- **Comorbidities associated with increased hazard of death in both populations, included diabetes, ischemic heart disease, depression, anxiety, and chronic lung disease**

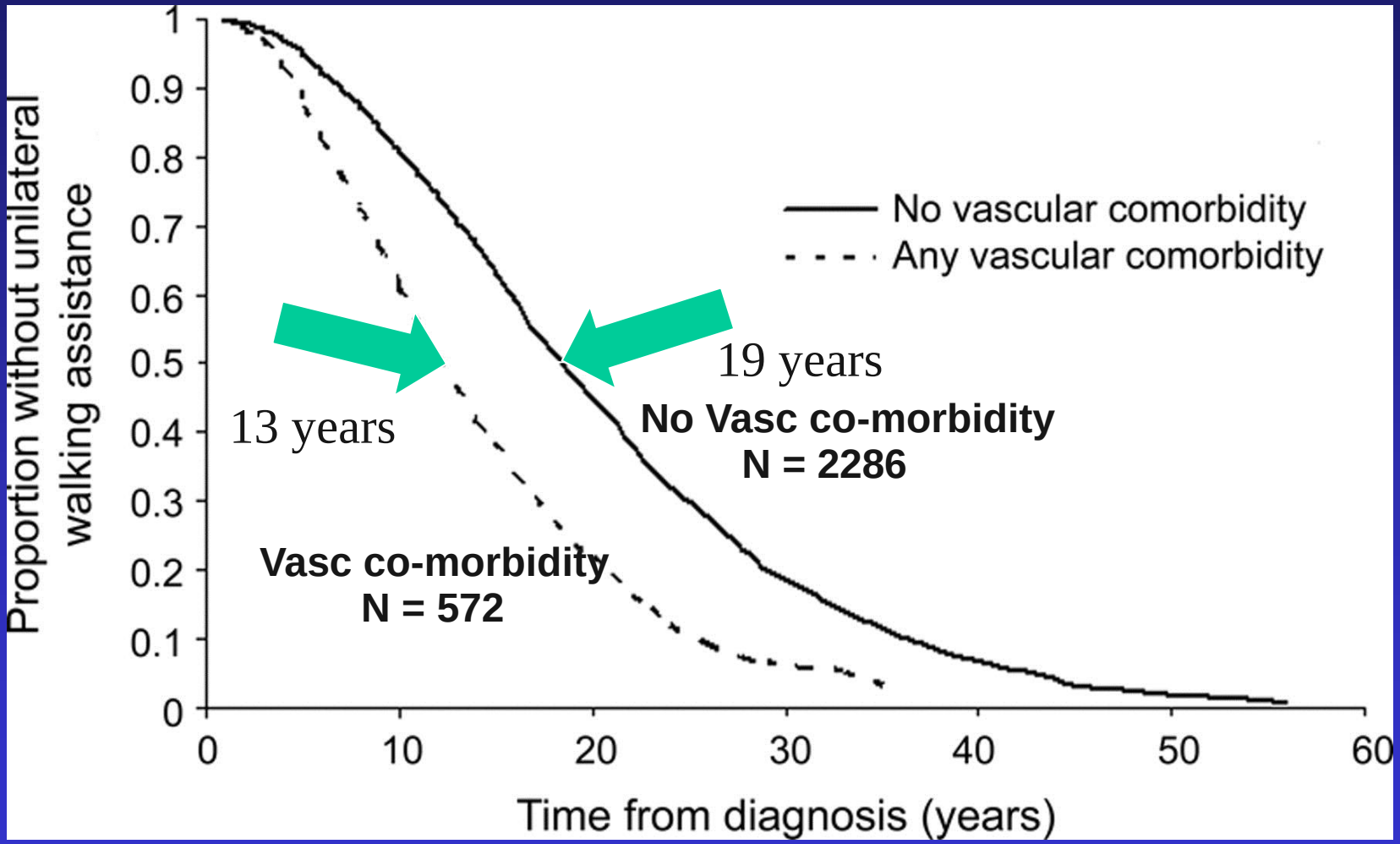
Neurology. 2015 May 27. Effect of comorbidity on mortality in multiple sclerosis. Marrie RA1, Elliott L2, Marriott J2, Cossoy M2, Blanchard J2, Leung S2, Yu N2. Canada

MS Disability and Vascular Comorbidities

- **Vascular co-morbidity - > 50%**
  - Hypercholesterolemia – 37%
  - Hypertension -30%
  - Heart disease - 7%
  - Diabetes – 6%
  - Peripheral Vascular Disease – 2%
- **16% had 2 vascular co-morbidity; 4% had 3**

Marrie R et al. Neurology 2010;74:1041-1047

Vascular Risk Factors Increase Risk of MS Disability



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Vascular Risk Factors Increase Risk of MS Disability

- More than 50% of NARCOMS survey responders had at least one vascular comorbidity at the time of their MS diagnosis
- *A dose-response relationship between VDRF and MS disability with* presence of a single VDRF increasing the risk of early gait disability by 51% and presence of 2 of these conditions increasing the risk to 228%

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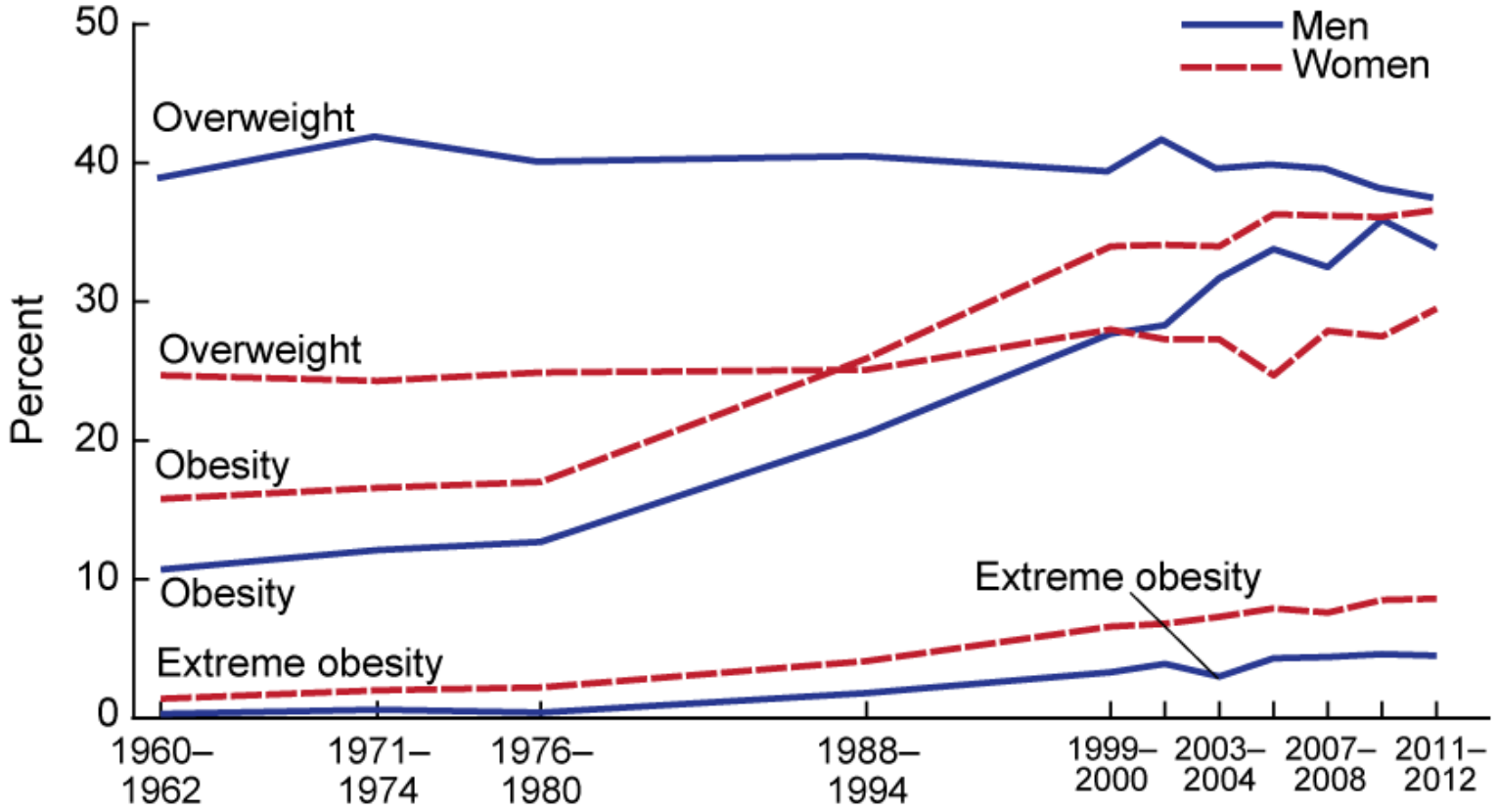
Figure. Trends in adult overweight, obesity, and extreme obesity among men and women aged 20–74: United States, selected years 1960–1962 through 2011–2012



NOTES: Age-adjusted by the direct method to the year 2000 U.S. Census Bureau estimates using age groups 20–39, 40–59, and 60–74. Pregnant females were excluded. Overweight is body mass index (BMI) of 25 or greater but less 30; obesity is BMI greater than or equal to 30; and extreme obesity is BMI greater than or equal to 40.

SOURCE: CDC/NCHS, National Health Examination Survey 1960–1962; and National Health and Nutrition Examination Surveys 1971–1974; 1976–1980; 1988–1994; 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, and 2011–2012.

BMI Linked to Risk of MS Progression in Observational Study

- 5 year follow up, 150 people with MS
- Retrospective study
- Associations between body weight, MRI, and disability (EDSS)
- Overweight and obese patients - more likely to show a significant progression of MS disease markers or symptoms than people with normal weight

Zacharia et al, June 2015, CMSC annual meeting abstract

Lipid profile and MRI lesion formation in MS

- Lipid profiles - associated with lesion formation over 24 months
- 135 CIS pts (≥2 brain MRI lesions and ≥2 oligoclonal bands)
- Higher LDL-C and Total cholesterol levels - increased cumulative number of new T2 lesions over 2 years
- Higher TC was associated as a trend with lower baseline whole brain volume (p=0.020)

J Neurol Neurosurg Psychiatry. 2013 Apr 17. Lipid profiles are associated with lesion formation over 24 months in interferon-β treated patients following the first demyelinating event. Weinstock-Guttman B, et al Ramanathan M.

Lipids, Statins and MS

- Adverse lipid profile associated with high levels of MS disability and disease progression
- Statin use not beneficial on clinical outcomes in MS

Mult Scler. 2014 Nov;20(13):1737-44. An adverse lipid profile is associated with disability and progression in disability, in people with MS. Tettey P1, Simpson S Jr1, Taylor B1, Blizzard L1, Ponsonby AL2, Dwyer T2, Kostner K3, van der Mei I4

Wang J, Xiao Y, Luo M, Luo H. Statins for multiple sclerosis. Cochrane Database of Systematic Reviews 2011, Issue 12. Art. No.: CD008386

Diet and MS - Background

- Dr Swank's work at Montreal Neurological Institute
- 1948-1950 performed studies on prevalence of MS in Norway and its relationship with diet
  - MS much less common in coastal regions vs inland; inland population ate diet much higher in animal fats
- 1950 started patients on a diet with 10-15 gm of saturated fats with protein from seafood and skim milk

Diet and MS: Background

"Good dieters" (n=70)

– Followed a low-fat diet (Consuming less than 20 g/d of sat. fat)

- **34 years later: 23 deaths**
- **In year 2000: 15 survivors**
- **13 /15 were still ambulatory and otherwise healthy**

"Bad dieters" (n=74)

– Consumed more than 20 g/d of sat. fat

- **34 years later: 58 deaths**
- **In year 2000: no survivors**

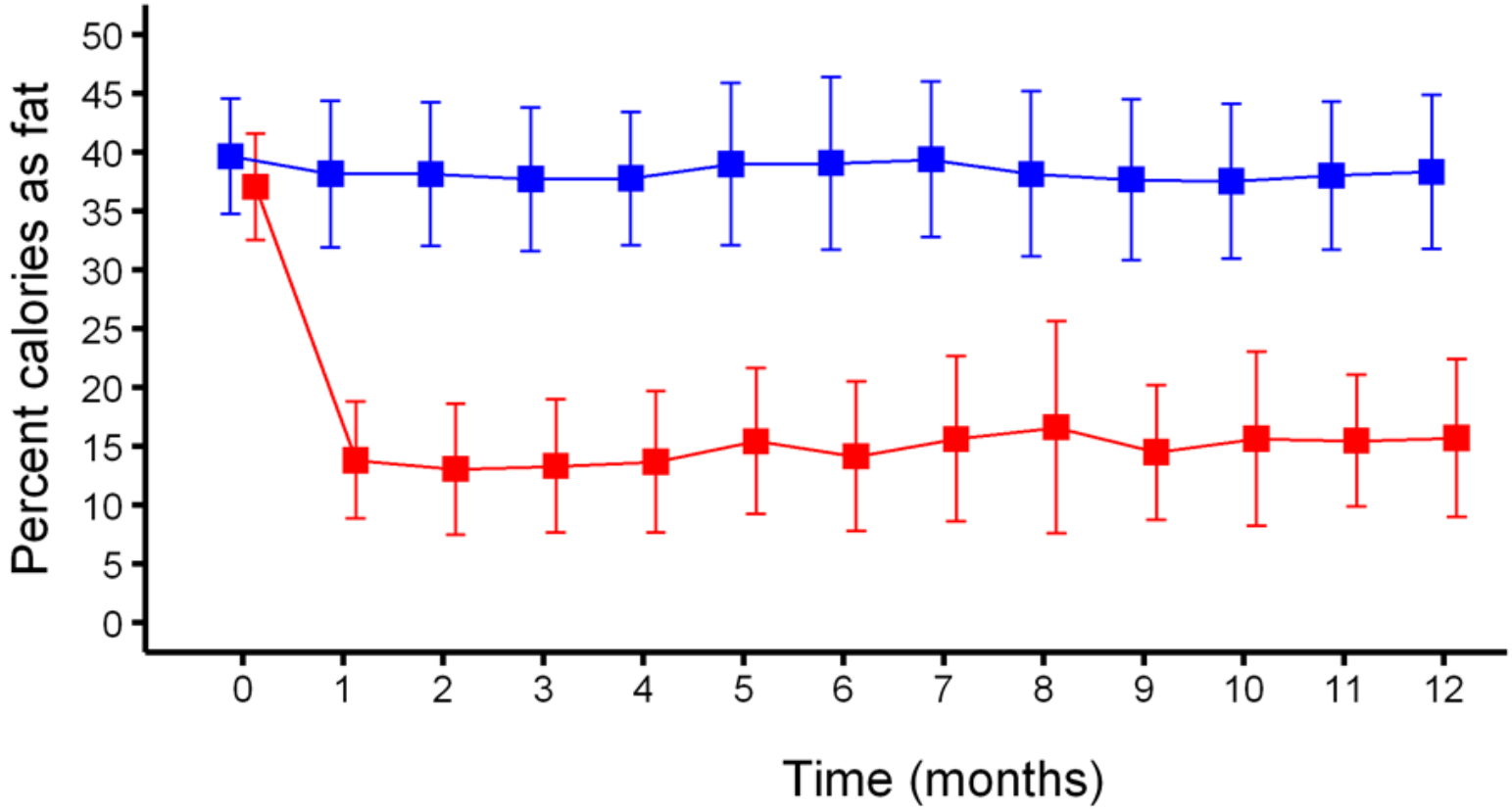
Swank, R.L. and B.B. Dugan, Effect of low saturated fat diet in early and late cases of multiple sclerosis. Lancet, 1990. 336(8706): p. 37-9.
Swank, R.L. and J. Goodwin, Review of MS patient survival on a Swank low saturated fat diet. Nutrition, 2003. 19(2): p. 161-2.

A Randomized-Controlled Study of Diet & Multiple Sclerosis

- 61 people with MS participated
- Wait-list control group (N=29) vs. low fat, plant based diet (N=32)
- Trained in McDougall Diet and followed diet for one year

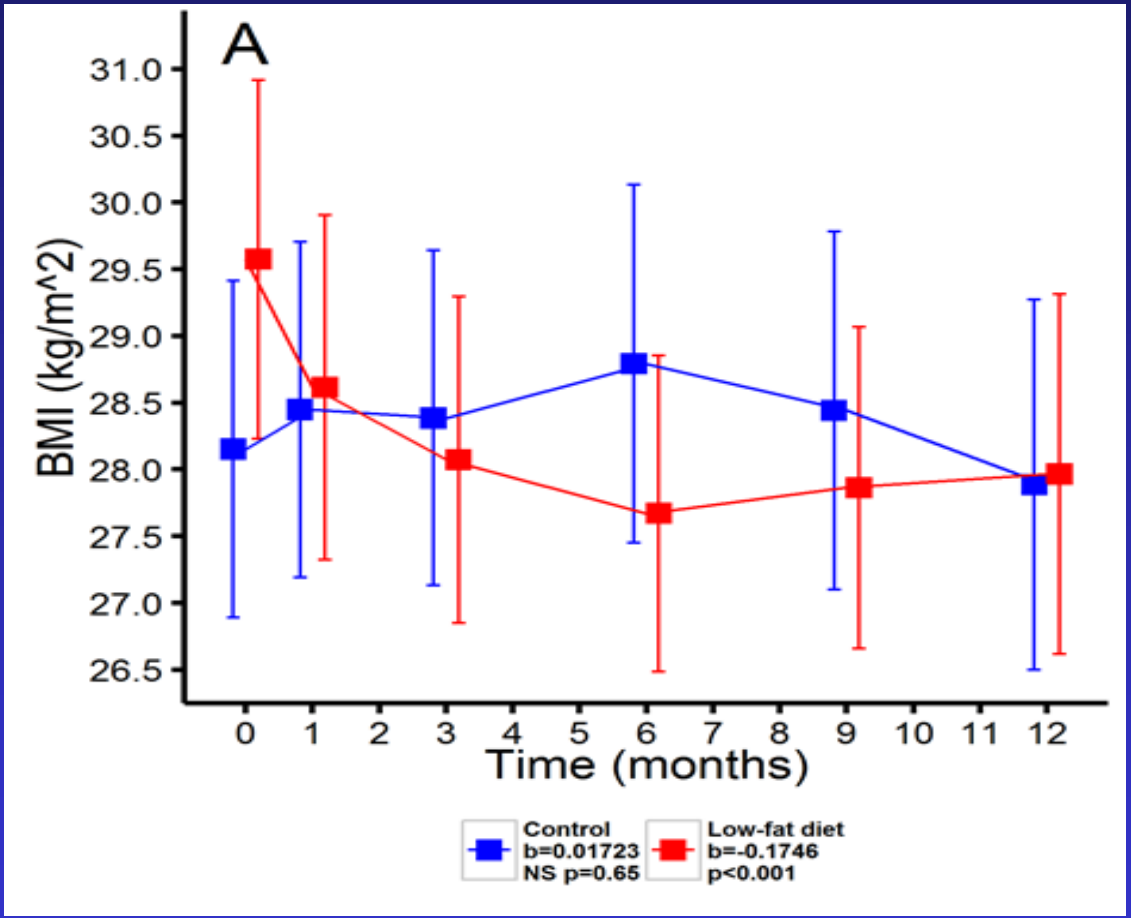
Yadav et al, Effects of a Low Fat Plant Based Diet in Multiple Sclerosis (MS): Results of a 1- Year Long Randomized Controlled (RC) Study. P6.152. AAN 2014 Annual Meeting, Philadelphia, USA
Yadav et al, Effects of a very low fat, plant-food-based diet on fatigue in multiple sclerosis: report of a pilot trial. P055; 2014 Joint ACTRIMS-ECTRIMS Meeting, Boston, Massachusetts, USA.

Diet Compliance



Group sample size	0	1	2	3	4	5	6	7	8	9	10	11	12
Control	29	29	27	29	27	28	29	29	29	29	28	27	27
Low-fat diet	32	31	29	30	28	29	28	28	28	26	26	25	26

Changes in body mass index during 1-year trial



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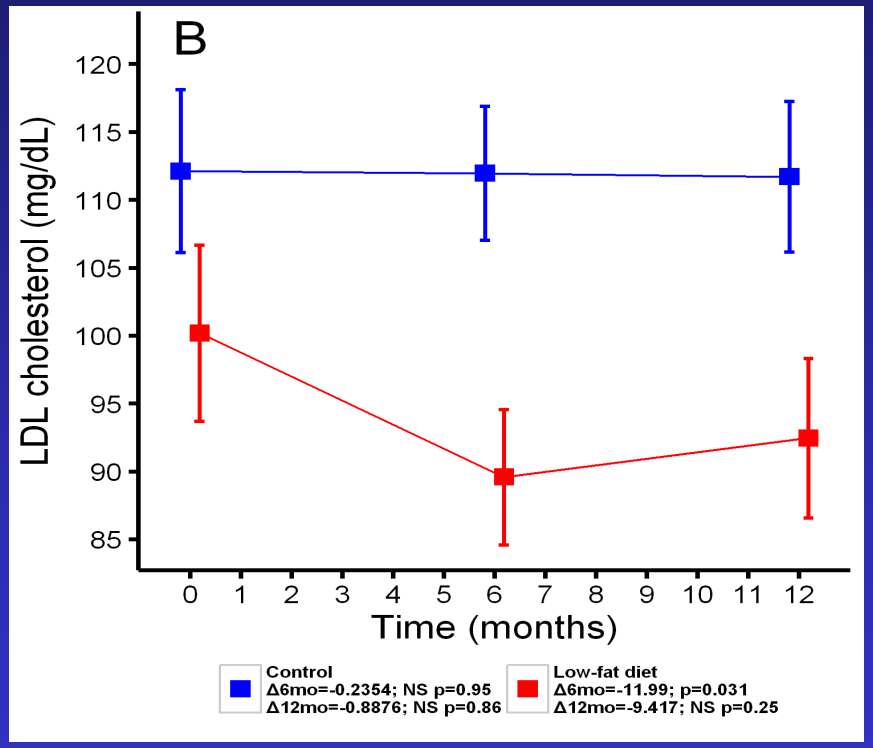
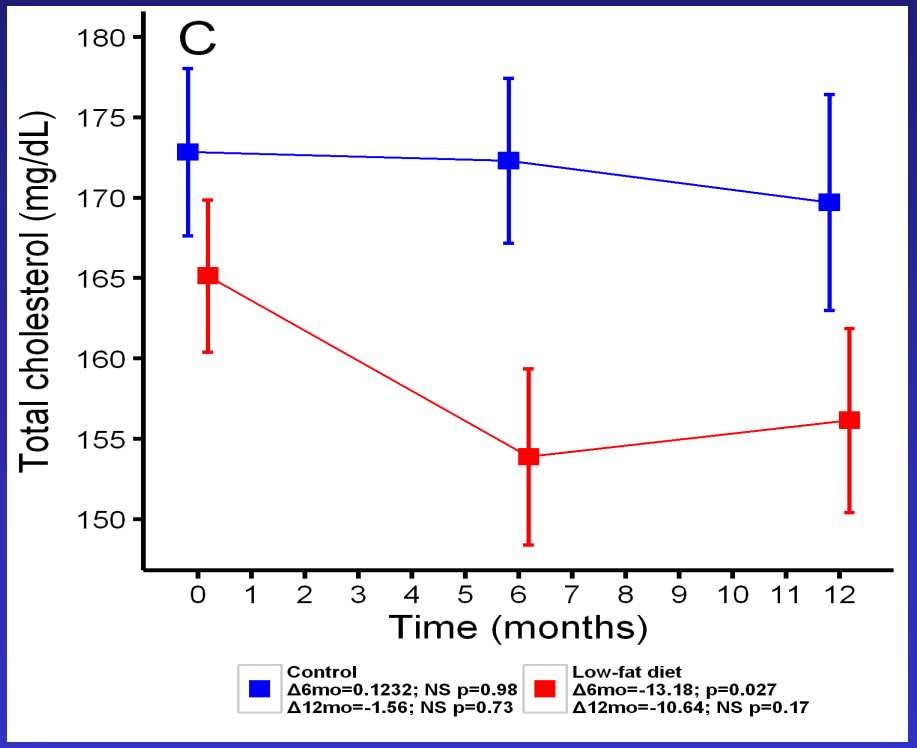
Changes in blood lipids during 1-year trial





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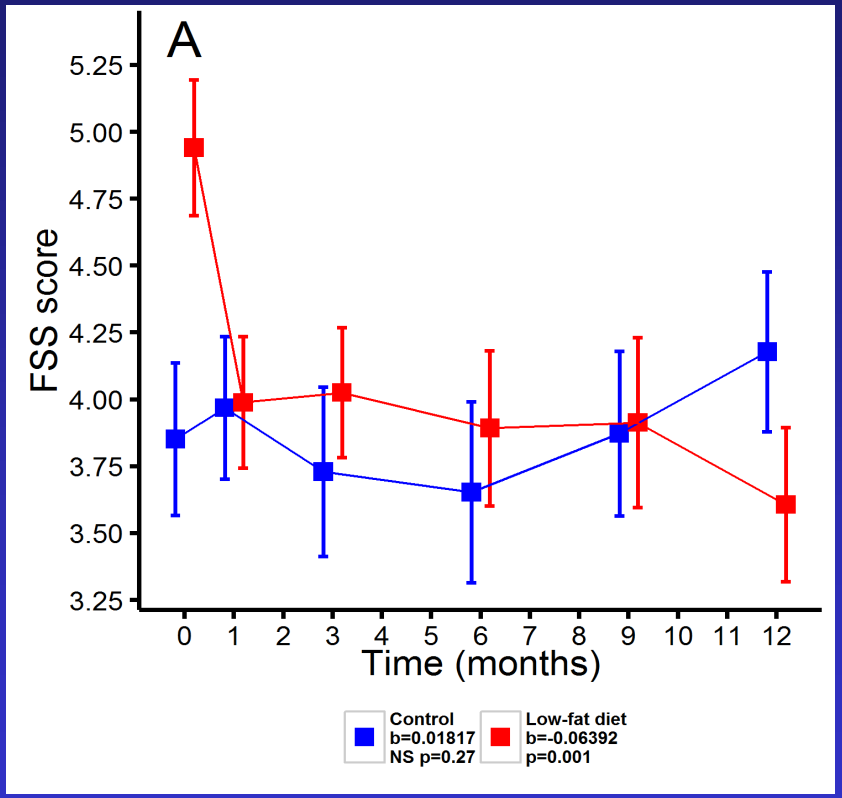
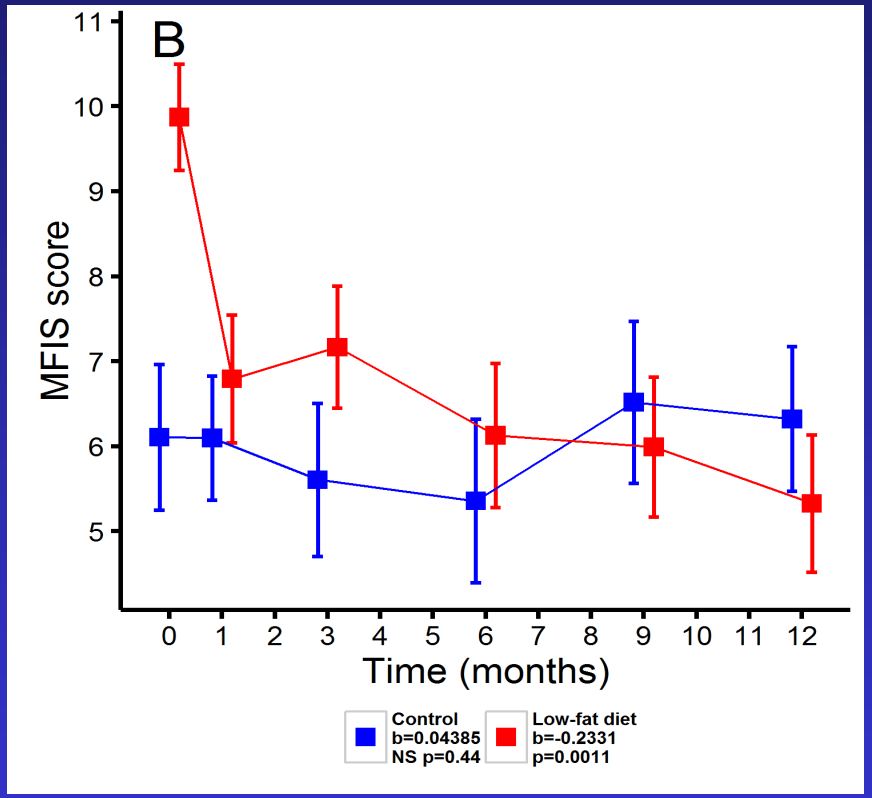
Improved fatigue in diet group





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	Fruits	Vegetables	Grains	Proteins	Dairy	Oils
Swank Diet	Yes	Yes *(Limit avocado, olives)*	No crackers, baked goods with fat	Limit portion size of poultry, fish, lean means	Non-fat dairy	No solid fats; *(Limit daily intake of fats)*
Plant-based *(e.g. McDougall)*	Yes	Starch-based + other brightly colored vegetables	Whole grains, unrefined flour, egg-free pasta	Beans, peas, legumes *(No animal protein sources)*	No	No added fats; no nuts/seeds
High-protein *(e.g. Paleo)*	Fresh fruit; Avoid high sugar juices *(No processed fruits)*	Fresh vegetables No starchy vegetables *(No processed vegetables)*	No grains or cereals	Grass-produced meats, fish/ seafood, eggs, nuts, seeds *(No legumes)*	No	Olive, walnut, flaxseed, coconut *(No processed oils)*
Anti-inflammatory	Fruits with lower glycemic load	Brightly colored preferred; Antioxidant-rich herbs and spices	Whole & cracked grains, pasta	Fish/Seafood Whole soy foods *(Limit animal protein: Eggs, poultry, lean meat)*	Natural cheese/ yogurt *(Limited to 1-2x's/wk)*	Healthy fats; nuts, seeds
Gluten-Free			No barley, wheat, rye			

Proposed Pro-inflammatory Dietary Factors

- Saturated fatty acids of animal origin
- Unsaturated fatty acids in the trans configuration (hydrogenated fatty acids)
- Red meat
- Sweetened drinks, and in general hypercaloric diets rich in refined (low-fiber) carbohydrates, in addition to animal fat
- Increased dietary salt intake
- Cow's milk proteins of the milk fat globule membrane (MFGM proteins)

Polyphenols

- Present in vegetables, cereals, legumes, spices, herbs, fruits, wine, fruit juices, tea, and coffee
- Anti-inflammatory, immune-modulatory,
- anti-angiogenic, and antiviral properties
- Include flavonoids and non-flavonoids molecules

Polyphenols

- Most important flavonoids: quercetin (onions, apples, citrus fruit, and wine), catechins (green tea)
- Most important nonflavonoids: resveratrol (chocolate, peanuts, berries, black grapes, and red wine), curcumin (spice turmeric of ginger family, curry), and hydroxytyrosol (olive oil)

Vitamin D and MS

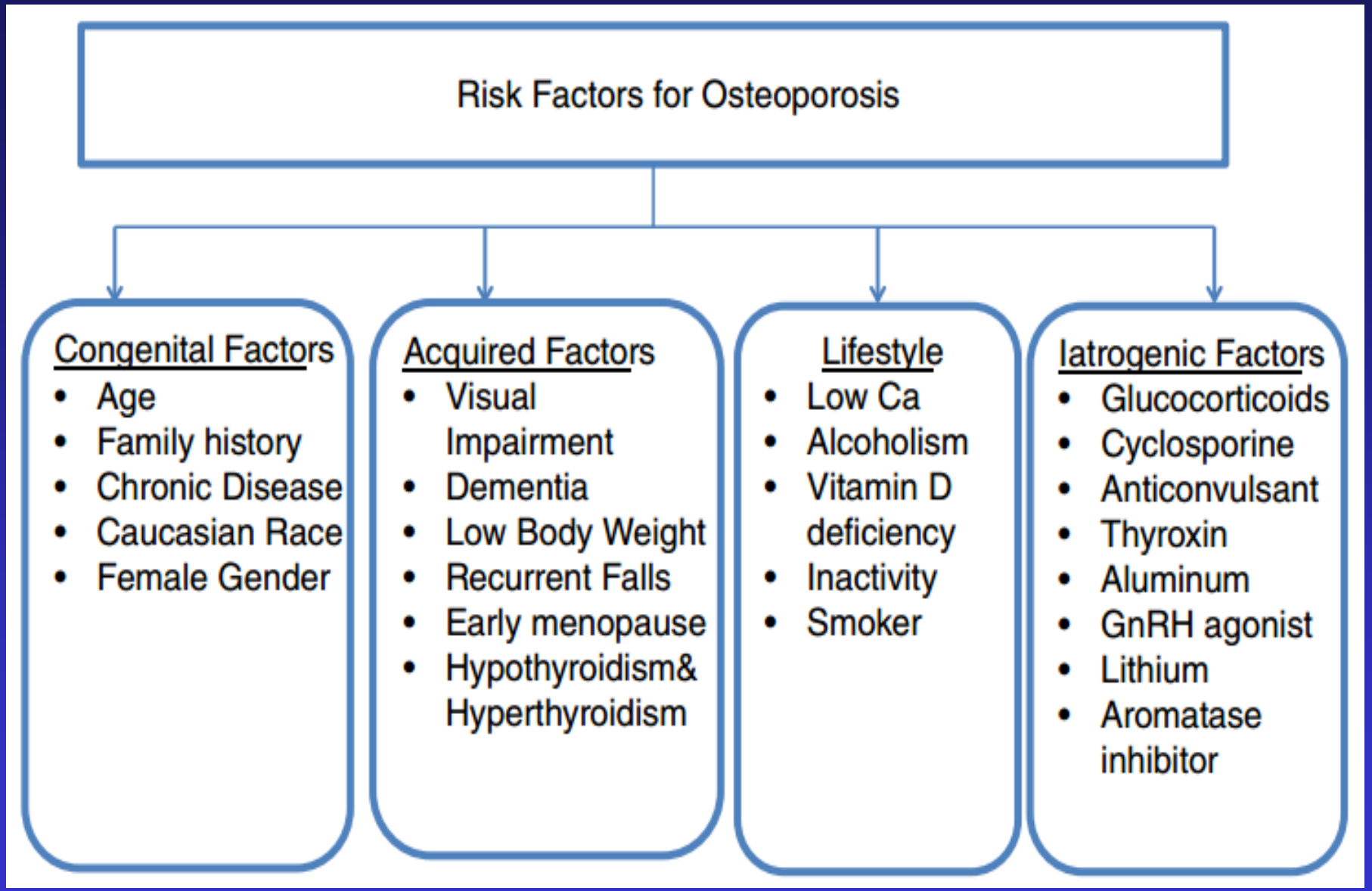
- **High serum vitamin D levels associated with a decreased risk of developing MS among Caucasians**
  - Munger et al, JAMA 2006; 20:2832-8
- **Low serum vitamin D levels appear to be associated with increase risk of having relapses**
  - Studies suggest that for each 10 nmol/l increase in vitamin D level there is a 12% reduction in risk of having relapse

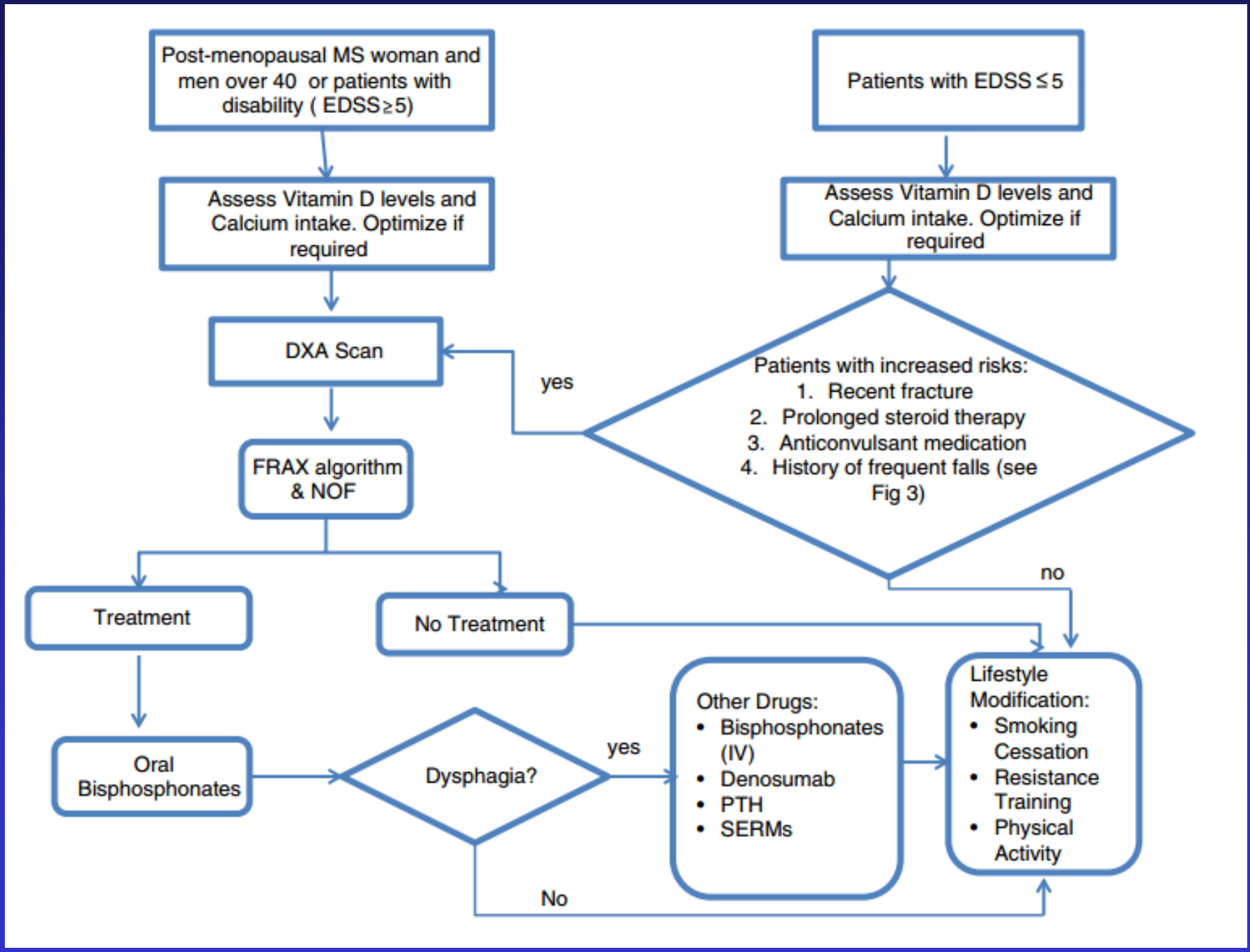
Simpson et al Ann Neurol 2010; 68:193-203

Osteoporosis is more prevalent in MS than general population

- 27.2 % (2,501/9,029) reported low bone mass and 15.4 % reported osteoporosis
- Data from a large MS center found that 80 % of males with MS evaluated with DXA scan had reduced bone mass at the lumbar spine or femoral neck
- Reduced bone mass also translated into increased fracture rates as was shown by Cosman et al. In this study, 22 % of patients with MS suffered fractures as compared with only 2 % of age-matched controls

Marrie et al. conducted a study using North American Research Committee on Multiple Sclerosis (NARCOMS) data


Risk Factors for Osteoporosis
Congenital Factors
Age
Family history
Chronic Disease
Caucasian Race
Female Gender
Acquired Factors
Visual Impairment
Dementia
Low Body Weight
Recurrent Falls
Early menopause
Hypothyroidism& Hyperthyroidism
Lifestyle
Low Ca
Alcoholism
Vitamin D deficiency
Inactivity
Smoker
Iatrogenic Factors
Glucocorticoids
Cyclosporine
Anticonvulsant
Thyroxin
Aluminum
GnRH agonist
Lithium
Aromatase inhibitor


Post-menopausal MS woman and men over 40 or patients with disability (EDSS≥5)
Assess Vitamin D levels and Calcium intake. Optimize if required
DXA Scan
FRAX algorithm & NOF
Treatment
Oral Bisphosphonates
Dysphagia?
yes
No
Other Drugs:
• Bisphosphonates (IV)
• Denosumab
• PTH
• SERMs
Patients with EDSS ≤ 5
Assess Vitamin D levels and Calcium intake. Optimize if required
Patients with increased risks:
1. Recent fracture
2. Prolonged steroid therapy
3. Anticonvulsant medication
4. History of frequent falls (see Fig 3)
yes
no
No Treatment
Lifestyle Modification:
• Smoking Cessation
• Resistance Training
• Physical Activity

What should be done?

- Wide range in disease course severity and the risk of malnutrition among MS patients
- Registered dietitians working with MS patients should review the signs and symptoms obtained in the nutrition assessment and diagnose nutrition problems based on these signs and symptoms
- Consider -Weight and weight history - when malnutrition is suspected

What can be done?

- Common problems that may be modified by nutrition care: dysphagia and constipation
- Attention to MS
  - Patient's appetite
  - Ability to eat with or without assistance
  - Arrangements regarding food shopping and cooking
- Supportive nutrition education tailored to the individual can help a MS person meet nutritional needs and regain some feeling of control in his or her life

What can be done now?

- **Vascular disease risk factor reduction**
  - Diet and life style interventions
- **Obesity – optimal BMI**
  - Fatigue improvement and weight reduction
- **Vit D – optimal dosing**
- **Bone health**
- **Exercise and its benefits**

Thank You